USDA Natural Resources Conservation Service

Ecological site R025XY085NV
Juniper Savanna

Last updated: 4/25/2024
Accessed: 05/20/2024

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 025X–Owyhee High Plateau

MLRA Notes 25—Owyhee High Plateau
This area is in Nevada (56 percent), Idaho (30 percent), Oregon (12 percent), and Utah (2 percent). It makes up about 27,443 square miles. MLRA 25 is characteristically cooler and wetter than the neighboring MLRAs of the Great Basin. The western boundary is marked by a gradual transition to the lower and warmer basins of MLRA 24. The boundary to the south-southeast, with MLRA 28B, is marked by gradual changes in geology marked by an increased dominance of singleleaf pinyon and Utah juniper and a reduced presence of Idaho fescue. The boundary to the north, with MLRA 11, is a rapid transition from the lava plateau topography to the lower elevation Snake River Plain.
Physiography:
All of this area lies within the Intermontane Plateaus. The southern half is in the Great Basin section of the Basin and Range province. This part of the MLRA is characterized by isolated, uplifted fault-block mountain ranges separated by narrow, aggraded desert plains. This geologically older terrain has been dissected by numerous streams draining to the Humboldt River.
The northern half of the area lies within the Columbia Plateaus province. This part of the MLRA forms the southern boundary of the extensive Columbia Plateau basalt flows. Most of the northern half is in the Payette section, but the northeast corner is in the Snake River Plain section. Deep, narrow canyons draining into the Snake River have been incised into this broad basalt plain. Elevation ranges from 3,000 to 7,550 feet on rolling plateaus and in gently sloping basins. It is more than 9,840 feet on some steep mountains. The Humboldt River crosses the southern half of this area
Geology:
The dominant rock types in this MLRA are volcanic. They include andesite, basalt, tuff, and rhyolite. In the north and west parts of the area, Cretaceous granitic rocks are exposed among Miocene volcanic rocks in mountains. A Mesozoic igneous and metamorphic rock complex dominates the south and east parts of the area. Upper and Lower Paleozoic calcareous sediments, including oceanic deposits, are exposed with limited extent in the mountains. Alluvial fan and basin fill sediments occur in the valleys.
Climate:
The average annual precipitation in most of this area is typically 11 to 22 inches. It increases to as much as 49 inches at the higher elevations. Rainfall occurs in spring and sporadically in summer. Precipitation occurs mainly as snow in winter. The precipitation is distributed fairly evenly throughout fall, winter, and spring. The amount of precipitation is lowest from midsummer to early autumn. The average annual temperature is 33 to 51 degrees F. The freeze-free period averages 130 days and ranges from 65 to 190 days, decreasing in length with elevation. It is typically less than 70 days in the mountains.
Water:
The supply of water from precipitation and streamflow is small and unreliable, except along the Owyhee, Bruneau, and Humboldt Rivers. Streamflow depends largely on accumulated snow in the mountains. Surface water from mountain runoff is generally of excellent quality and suitable for all uses. The basin fill sediments in the narrow alluvial valleys between the mountain ranges provide some ground water for irrigation. The alluvial deposits along the large streams have the most ground water. Based on measurements of water quality in similar deposits in

adjacent areas, the basin fill deposits probably contain moderately hard water. The water is suitable for almost all uses. The carbonate rocks in this area are considered aquifers, but they are little used. Springs are common along the edges of the limestone outcrops.

Soils:

The dominant soil orders in this MLRA are Aridisols and Mollisols. The soils in the area dominantly have a mesic or frigid temperature regime and an aridic, aridic bordering on xeric, or xeric moisture regime. Soils with aquic moisture regimes are limited to drainage or spring areas, where moisture originates or runs on and through. These soils are of a very limited extent throughout the MLRA. They generally are well drained, clayey or loamy, and shallow or moderately deep. Most of the soils formed in mixed parent material. Volcanic ash and loess mantle the landscape. Surface soil textures are loam and silt loam with ashy texture modifiers in some areas. Argillic horizons occur on the more stable landforms. They are exposed nearer the soil surface on convex landforms, where ash and loess deposits are more likely to erode. Soils that formed in carbonatic parent material in areas that receive less than 12 inches of precipitation are characterized by calcic horizons throughout the profile, while soils in areas that receive more than 12 inches of precipitation do not have calcic horizons in the upper part of the profile. Soils that formed on stable landforms at the lower elevations are dominated by ochric horizons. Soils that formed at the middle and upper elevations are characterized by mollic epipedons. Soils in drainage areas at all elevations that receive moisture running on or through them are characterized by thicker mollic epipedons.

Biological Resources:

This MLRA supports shrub-grass vegetation. Lower elevations are characterized by Wyoming big sagebrush associated with bluebunch wheatgrass, western wheatgrass, and Thurber’s needlegrass. Other important plants include bluegrass, squirreltail, penstemon, phlox, milkvetch, lupine, Indian paintbrush, aster, and rabbitbrush. Black sagebrush occurs but is less extensive. Singleleaf pinyon and Utah juniper occur in limited areas. With increasing elevation and precipitation, vast areas characterized by mountain big sagebrush or low sagebrush/early sagebrush in association with Idaho fescue, bluebunch wheatgrass, needlegrasses, and bluegrass become common. Snowberry, curl-leaf mountain mahogany, ceanothus, and juniper also occur. Mountains at the highest elevations support whitebark pine, Douglas-fir, limber pine, Engelmann spruce, subalpine fir, aspen, and curl-leaf mountain mahogany.

Major wildlife species include mule deer, bighorn sheep, pronghorn, mountain lion, coyote, bobcat, badger, river otter, mink, weasel, golden eagle, red-tailed hawk, ferruginous hawk, Swainson’s hawk, northern harrier, prairie falcon, kestrel, great horned owl, short-eared owl, long-eared owl, burrowing owl, pheasant, sage grouse, chukar, gray partridge, and California quail. Reptiles and amphibians include western racer, gopher snake, western rattlesnake, side-blotched lizard, western toad, and spotted frog. Fish species include bull, red band, and rainbow trout.

Ecological site concept

The Juniper Savanna ecological site is characterized by a widely spaced junipers. It is found on middle elevation fan piedmonts. Soils are commonly derived from limestone, characterized by an ochric epidpedon, and are shallow or very shallow over a duripan. This ecological site exists in a precipitation zone that does not facilitate rapid infilling by trees or support enough herbaceous biomass to form a mollic epipedon.

Associated sites

R025XY019NV	**LOAMY 8-10 P.Z.**
R025XY080NV	**Shrubby Snowfield**

Similar sites

F025XY059NV	**Gravelly Juniper** JUOS/ARTRW8/PSSP6-ACTH7
F025XY060NV	**Thin Surface Juniper** JUOS/ARNO4/PSSPS-ACTH7-ACHY

Table 1. Dominant plant species

Tree	(1) *Juniperus osteosperma*

Shrub	(1) *Artemisia tridentata*
Herbaceous	(1) *Pseudoroegneria spicata*

Physiographic features

The Juniper Savanna site is found on fan remnants and ballenas. Aspect is not an influencing factor on this site. Landscape position is usually linear or convex-linear; this site does not receive run-on moisture from the surrounding area. Elevation ranges from 5000 to 7000 feet and slopes range from 1 to 15 percent.

Table 2. Representative physiographic features

Landforms	(1) Fan remnant (2) Ballena
Runoff class	High to very high
Flooding frequency	None
Ponding frequency	None
Elevation	5,000–7,000 ft
Slope	4–15%
Water table depth	72 in
Aspect	Aspect is not a significant factor

Climatic features

The climate associated with this site is semiarid, characterized by cold, moist winters and warm, dry summers. The average annual precipitation ranges from 10 to 12 inches. Mean annual air temperature is about 45 to 50 degrees F.

Mean annual precipitation across the range in which this ES occurs is 12.20".

Monthly mean precipitation: January 1.22”; February 0.92”; March 1.17”; April 1.20”; May 1.54”; June 1.11”; July 0.44”; August 0.45”; September 0.73”; October 0.86”; November 1.26”; December 1.29”.

*The above data is averaged from the Deeth and Tuscarora WRCC climate stations.

Table 3. Representative climatic features

Frost-free period (characteristic range)	25-51 days
Freeze-free period (characteristic range)	79-94 days
Precipitation total (characteristic range)	12-13 in
Frost-free period (actual range)	18-58 days
Freeze-free period (actual range)	75-98 days
Precipitation total (actual range)	12-13 in
Frost-free period (average)	38 days
Freeze-free period (average)	87 days
Precipitation total (average)	13 in

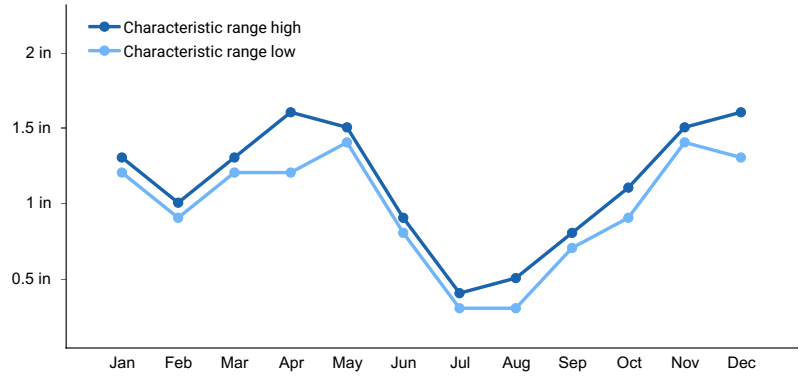


Figure 1. Monthly precipitation range

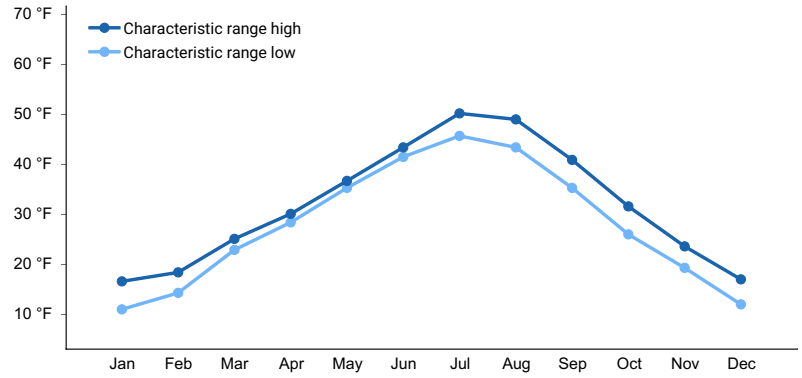


Figure 2. Monthly minimum temperature range

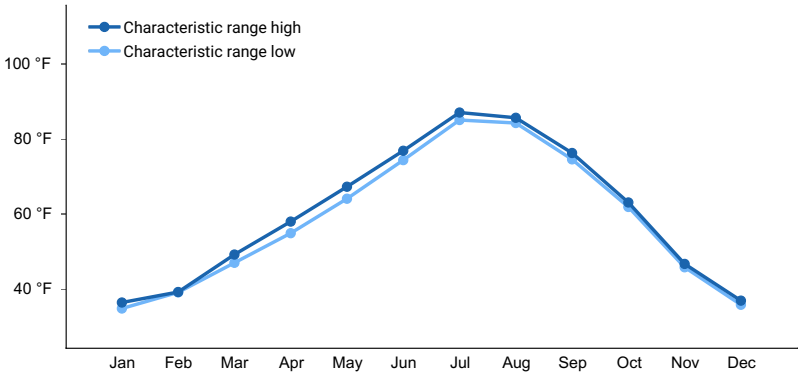


Figure 3. Monthly maximum temperature range

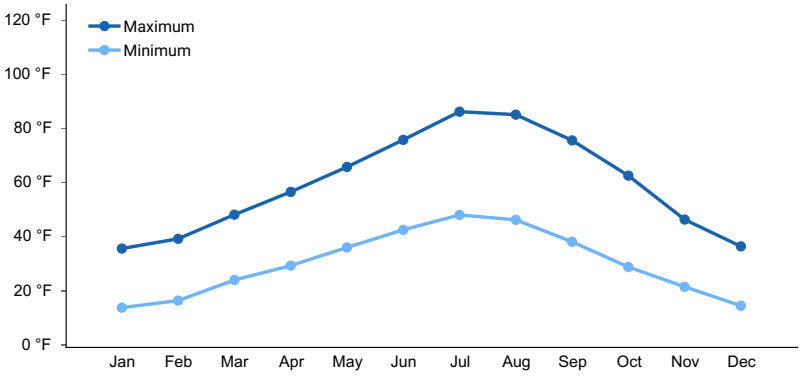


Figure 4. Monthly average minimum and maximum temperature

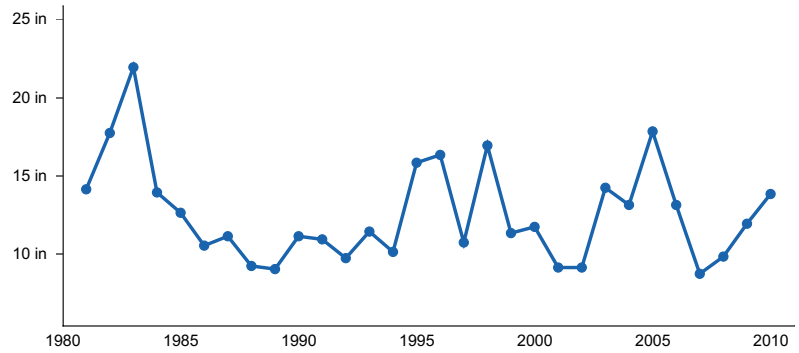


Figure 5. Annual precipitation pattern

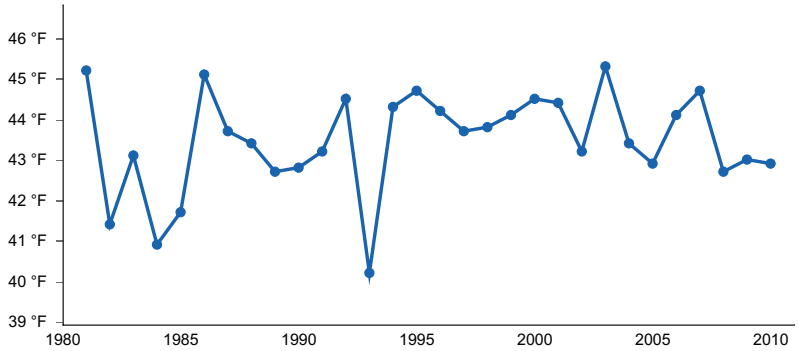


Figure 6. Annual average temperature pattern

Climate stations used

- (1) DEETH [USC00262189], Deeth, NV
- (2) TUSCARORA [USC00268346], Tuscarora, NV

Influencing water features

Influencing water features are not associated with this ecological site.

Soil features

Soils are typically shallow to a duripan. Textures are loamy, coarse loamy, or loamy skeletal throughout the control section. Surface soils are characterized by an ochric epipedon and are light in color. Soil moisture regime is aridic bordering on xeric and the soil temperature regime is mesic.

Soil series correlated with this site is: Karpp.

Table 4. Representative soil features

Parent material	(1) Alluvium–limestone
Surface texture	(1) Silt loam
Family particle size	(1) Loamy-skeletal
Drainage class	Moderately well drained to well drained
Permeability class	Slow to very slow
Depth to restrictive layer	14–20 in
Soil depth	14–20 in
Surface fragment cover <=3"	5–15%
Surface fragment cover >3"	0–5%

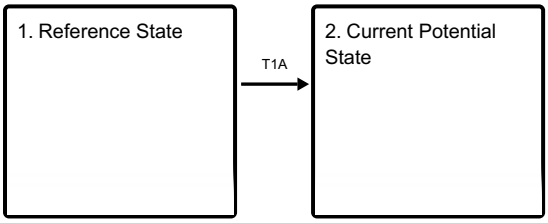
Available water capacity (0-40in)	1.5–2.4 in
Calcium carbonate equivalent (0-40in)	1–10%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	35–45%
Subsurface fragment volume >3" (Depth not specified)	0–5%

Ecological dynamics

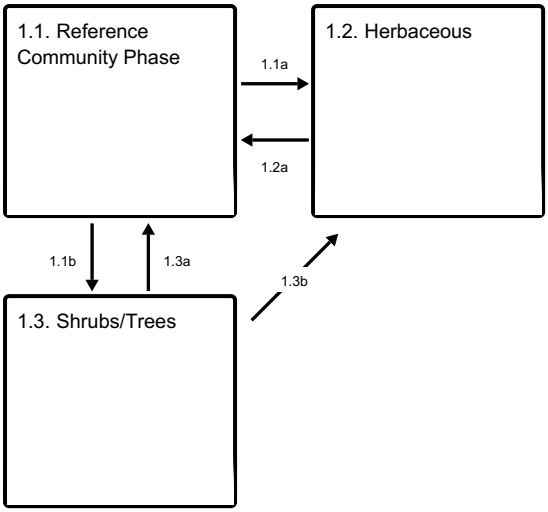
Abiotic features:
The primary abiotic factors driving this site are the droughty conditions and extended disturbance return intervals.
Ecological dynamics:
The plant communities of this site are dynamic in response to changing weather patterns and disturbance regimes. The reference community phase is dominated by big sagebrush (*Artemisia tridentata*) and deep-rooted, cool season perennial bunchgrasses such as Thurber's needlegrass and Indian ricegrass (*Achnatherum hymenoides*). Utah juniper (Juiperus osteosperms) is apparent in the visual aspect of the site.
Sagebrush species are generally long-lived; therefore, it is not necessary for new individuals to recruit every year for perpetuation of the stand. Infrequent large recruitment events and simultaneous low, continuous recruitment is the foundation of population maintenance (Noy-Meir 1973). Survival of sagebrush seedlings is dependent on adequate moisture conditions. Young plants are susceptible to less than desirable conditions for several years following germination. Density and age of sagebrush and other woody perennials in the community is largely dependent upon fire frequency.

State and transition model

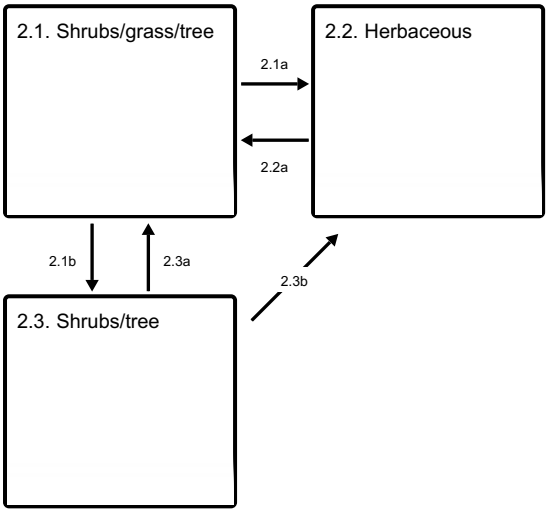
Ecosystem states



State 1 submodel, plant communities



State 2 submodel, plant communities



State 1
Reference State

The reference state is representative of the natural range of variability prior to Euro-American settlement conditions. Community phase changes are primarily driven by time, drought, and infrequent wildfire. State dynamics are maintained by interactions between climatic patterns and disturbance regimes. Natural disturbances under pristine conditions included periodic burning set by native peoples, drought, insect attack, and herbivory by native fauna. The reference state has three general community phases a perennial grass dominant phase, a perennial grass-shrub mixture with scattered trees and a shrub-dominant phase with some tree infilling. Disturbance favors the grass-dominated and grass-shrub phases and less frequent disturbance favors the shrub-dominated phase.

Community 1.1
Reference Community Phase

Wyoming big sagebrush, bluebunch wheatgrass and Thurber’s needlegrass dominate the site. Indian ricegrass, Sandberg bluegrass, basin wildrye, squirreltail and perennial forbs are also common on this site.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	90	180	270
Grass/Grasslike	60	120	180
Forb	40	80	120
Tree	10	20	30
Total	**200**	**400**	**600**

Table 6. Ground cover

Tree foliar cover	1-12%
Shrub/vine/liana foliar cover	5-15%
Grass/grasslike foliar cover	5-20%
Forb foliar cover	2-15%
Non-vascular plants	0-5%
Biological crusts	0-5%
Litter	5-25%
Surface fragments >0.25" and <=3"	5-20%
Surface fragments >3"	5-10%
Bedrock	0-1%
Water	0%
Bare ground	30-50%

Table 7. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	–	–	–
>0.5 <= 1	–	–	–	–
>1 <= 2	–	–	–	–
>2 <= 4.5	–	–	–	–
>4.5 <= 13	5-7%	–	–	–
>13 <= 40	1-5%	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Community 1.2
Herbaceous

This community phase is characteristic of a post-disturbance, early to mid-seral community phase. Rabbitbrush, horsebrush, spiny hopsage and perennial grasses such as bluebunch wheatgrass, Indian ricegrass and squirreltail are common. Wyoming big sagebrush is killed by fire, therefore decreasing within the burned community. Sagebrush could still be present in unburned patches. Thurber’s needlegrass can experience high mortality from fire and may be reduced in the community for several years.

Community 1.3
Shrubs/Trees

Wyoming big sagebrush increases in the absence of disturbance. Decadent sagebrush dominates the overstory and the deep-rooted perennial bunchgrasses in the understory are reduced either from competition with shrubs or from herbivory. Sandberg bluegrass will likely increase in the understory and may be the dominant grass on the site.

Pathway 1.1a
Community 1.1 to 1.2

Fire would decrease or eliminate the overstory of sagebrush and allow for the perennial bunchgrasses to dominate the site. Fires would typically be small and patchy due to low fuel loads. A fire following an unusually wet spring or a change in management may be more severe and reduce sagebrush cover to trace amounts. A severe infestation of Aroga moth could also cause a large decrease in sagebrush within the community, giving a competitive advantage to the perennial grasses and forbs.

Pathway 1.1b
Community 1.1 to 1.3

Long-term drought, time and/or herbivory favor an increase in Wyoming big sagebrush over deep-rooted perennial bunchgrasses. Combinations of these would allow the sagebrush overstory to increase and dominate the site, causing a reduction in the perennial bunchgrasses. Sandberg bluegrass may increase in density depending on the grazing management.

Pathway 1.2a
Community 1.2 to 1.1

Time and lack of disturbance allows for sagebrush to reestablish.

Pathway 1.3a
Community 1.3 to 1.1

Aroga moth infestation and or release from growing season herbivory may reduce sagebrush dominance and allow recovery of the perennial bunchgrass understory.

Pathway 1.3b
Community 1.3 to 1.2

Fire would decrease or eliminate the overstory of sagebrush and allow for the perennial bunchgrasses to dominate the site. Fires would typically be small and patchy due to low fuel loads. A fire following an unusually wet spring or a change in management may be more severe and reduce sagebrush cover to trace amounts. A severe infestation of Aroga moth could also cause a large decrease in sagebrush within the community, giving a competitive advantage to the perennial grasses and forbs.

State 2
Current Potential State

This state is similar to the Reference State. Ecological function has not changed, however the resiliency of the state has been reduced by the presence of invasive weeds. This state has the same three general community phases. Negative feedbacks enhance ecosystem resilience and contribute to the stability of the state. These include the presence of all structural and functional groups, low fine fuel loads and retention of organic matter and nutrients. Positive feedbacks decrease ecosystem resilience and stability of the state. These include the non-natives high seed output, persistent seed bank, rapid growth rate, ability to cross pollinate and adaptations for seed dispersal. Additionally, the presence of highly flammable, non-native species reduces State resilience because these species can promote fire where historically fire has been infrequent leading to positive feedbacks that further the degradation of the system.

Community 2.1
Shrubs/grass/tree

Wyoming big sagebrush, bluebunch wheatgrass, and Thurber’s needlegrass dominate the site. Indian ricegrass, Sandberg bluegrass, basin wildrye, squirreltail and perennial forbs are also common on this site. Non-native annual species are present in minor amounts. Utah juniper is less than 15 percent cover.

Community 2.2
Herbaceous

This community phase is characteristic of a post-disturbance, early seral community phase. Rabbitbrush, horsebrush, spiny hopsage and perennial bunchgrasses such as bluebunch wheatgrass, needleandthread and Indian ricegrass are common. Wyoming big sagebrush is killed by fire, therefore decreasing within the burned community. Sagebrush could still be present in unburned patches. Perennial forbs may increase or dominate after fire for several years. Thurber’s needlegrass can experience high mortality from fire and may be reduced in the community for several years. Annual non-native species generally respond well after fire and may be stable or increasing within the community. Rabbitbrush may dominate the aspect for a number of years following wildfire.

Community 2.3
Shrubs/tree

Wyoming big sagebrush increases and the perennial understory is reduced. Decadent sagebrush dominates the overstory and the deep-rooted perennial bunchgrasses in the understory are reduced either from competition with shrubs or from inappropriate grazing management. Sandberg bluegrass will likely increase in the understory and may be the dominant grass on the site. Utah juniper may be present. Annual non-native species present.

Pathway 2.1a
Community 2.1 to 2.2

Fire would decrease or eliminate the overstory of sagebrush and allow for the perennial bunchgrasses to dominate the site. Fires would typically be small and patchy due to low fuel loads. A fire following an unusually wet spring or a change in management may be more severe and reduce sagebrush cover to trace amounts. A severe infestation of Aroga moth could also cause a large decrease in sagebrush within the community, giving a competitive advantage to the perennial grasses and forbs. Annual non-native species generally respond well after fire and may be stable or increasing within the community.

Pathway 2.1b
Community 2.1 to 2.3

Time, long-term drought, grazing management that favors shrubs or combinations of these would allow the sagebrush overstory to increase and dominate the site, causing a reduction in the perennial bunchgrasses. However, Sandberg bluegrass and/or squirreltail may increase in the understory depending on the grazing management. Heavy spring grazing will favor an increase in sagebrush. Annual non-native species may be stable or increasing within the understory.

Pathway 2.2a
Community 2.2 to 2.1

Absence of disturbance over time allows for the sagebrush to recover, or grazing management that favors shrubs.

Pathway 2.3a
Community 2.3 to 2.1

Low severity fire or Aroga moth infestation creates sagebrush/grass mosaic. Other disturbances/practices include brush management with minimal soil disturbance; late-fall/winter grazing causing mechanical damage to sagebrush.

Pathway 2.3b
Community 2.3 to 2.2

Fire would decrease or eliminate the overstory of sagebrush and allow for the perennial bunchgrasses to dominate

the site. Fires would typically be small and patchy due to low fuel loads. A fire following an unusually wet spring or a change in management may be more severe and reduce sagebrush cover to trace amounts. A severe infestation of Aroga moth could also cause a large decrease in sagebrush within the community, giving a competitive advantage to the perennial grasses and forbs.

Transition T1A
State 1 to 2

Trigger: This transition is caused by the introduction of non-native annual weeds, such as cheatgrass, mustard and halogeton. Slow variables: Over time the annual non-native plants will increase within the community decreasing organic matter inputs from deep-rooted perennial bunchgrasses resulting in reductions in soil water availability for perennial bunchgrasses. Threshold: Any amount of introduced non-native species causes an immediate decrease in the resilience of the site. Annual non-native species cannot be easily removed from the system and have the potential to significantly alter disturbance regimes from their historic range of variation.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**perennial grass**			60–170	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	45–65	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	20–45	–
	squirreltail	ELEL5	*Elymus elymoides*	1–20	–
	basin wildrye	LECI4	*Leymus cinereus*	1–20	–
	Sandberg bluegrass	POSE	*Poa secunda*	1–20	–
Forb					
2	**perennial forbs**			30–130	
	arrowleaf balsamroot	BASA3	*Balsamorhiza sagittata*	12–45	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	9–20	–
	lupine	LUPIN	*Lupinus*	9–20	–
	spreading phlox	PHDI3	*Phlox diffusa*	1–12	–
	longleaf phlox	PHLO2	*Phlox longifolia*	1–12	–
	cryptantha	CRYPT	*Cryptantha*	1–12	–
	western stoneseed	LIRU4	*Lithospermum ruderale*	1–12	–
3	**annual forbs**			0–10	
Shrub/Vine					
3	**primary shrubs**			100–250	
	big sagebrush	ARTR2	*Artemisia tridentata*	45–115	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	10–45	–
	Utah juniper	JUOS	*Juniperus osteosperma*	20–45	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	10–45	–
	spineless horsebrush	TECA2	*Tetradymia canescens*	5–20	–
	pricklypear	OPUNT	*Opuntia*	0–20	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	0–20	–
	Utah serviceberry	AMUT	*Amelanchier utahensis*	5–20	–
	Parry's blue eyed Mary	COPA2	*Collinsia parryi*	0–5	–
Tree					
5	**Trees**			5–15	
	Utah juniper	JUOS	*Juniperus osteosperma*	5–15	–

Table 9. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)	Diameter (In)	Basal Area (Square Ft/Acre)
Tree							
Utah juniper	JUOS	*Juniperus osteosperma*	Native	–	2–12	–	–

Inventory data references

Soils and Physiographic features were gathered from NASIS.

Type locality

Location 1: Elko County, NV	
Township/Range/Section	T29 N R55 E S6
General legal description	Elko County, Nevada; about 30 feet north of the road across Cedar Ridge; about 960 feet south and 750 feet west of the northeast corner of section 6, T. 29 N., R. 55 E

Other references

Houghton, J.G., C.M. Sakamoto, and R.O. Gifford. 1975. Nevada's Weather and Climate, Special Publication 2. Nevada Bureau of Mines and Geology, Mackay School of Mines, University of Nevada, Reno, NV.

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Noy-Meir, I. 1973. Desert ecosystems: environment and producers. Annual Review of Ecology and Systematics 4:25-51.

Contributors

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Approval

Kendra Moseley, 4/25/2024

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	05/20/2024
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

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5. **Number of gullies and erosion associated with gullies:**

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6. **Extent of wind scoured, blowouts and/or depositional areas:**

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7. **Amount of litter movement (describe size and distance expected to travel):**

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

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14. **Average percent litter cover (%) and depth (in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

17. **Perennial plant reproductive capability:**